

Iodine Satellite (iSat)

Completed Technology Project (2014 - 2017)



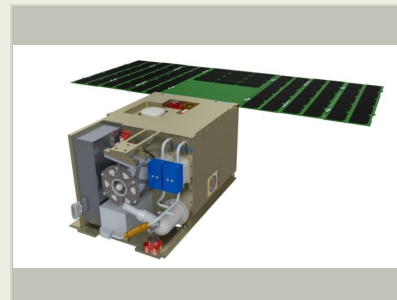
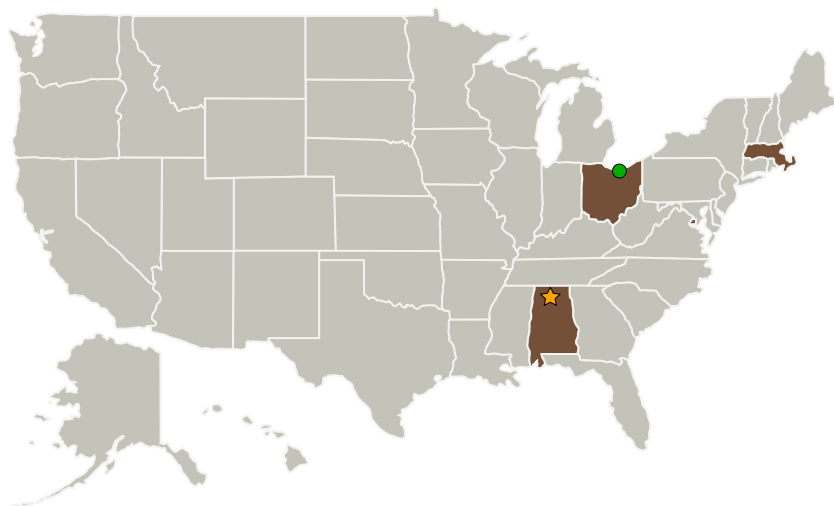
Project Introduction

The Iodine Satellite (iSat) spacecraft was a to be the first CubeSat to demonstrate high change in velocity from a secondary payload launch safe propulsion system using a Hall thruster modified to use iodine as a propellant. The mission was to demonstrate CubeSat maneuverability, including plane change, altitude change and change in its closest approach to Earth to ensure atmospheric reentry in less than 90 days.

Anticipated Benefits

Propulsion technology is often a critical enabling technology for space missions but secondary payload safety restrictions can make adding significant propulsion capabilities to small spacecraft challenging. Iodine can be launched as an inert solid and then vaporized into an ionized gas once in orbit, which removes the risk to the launch vehicle and primary payload. Launching as a dense solid instead of a gas also increases the amount propellant that can be stored in the same volume on the spacecraft. An iodine thruster like the one worked on under iSat would allow a small spacecraft to alter its orbital inclination and elevation, opening up a wider range of mission objectives than previously possible with spacecraft of this size.

Primary U.S. Work Locations and Key Partners



The Iodine Satellite (iSat) spacecraft will be the first CubeSat to demonstrate high change in velocity from a primary propulsion system by using Hall thruster technology and iodine as a propellant. The mission will demonstrate...

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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Air Force (USAF)	Supporting Organization	US Government	Washington, District of Columbia
Busek Company, Inc.	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Glenn Research Center (GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Alabama	District of Columbia
Massachusetts	Ohio

Project Transitions

▶ **July 2014:** Project Start

✓ **September 2017:** Closed out

Closeout Summary: It was determined during the course of this project that additional development related to iodine compatible cathodes was required before conducting an in space demonstration of the technology at this scale of thruster.

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Spacecraft Technology

Project Management

Program Director:

Christopher E Baker

Program Manager:

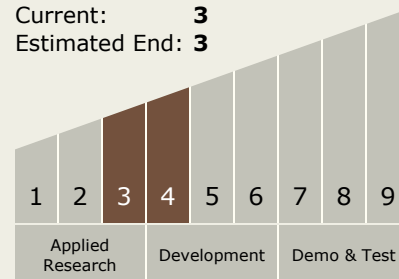
Roger Hunter

Principal Investigator:

John W Dankanich

Technology Maturity (TRL)

Start: **4**
Current: **3**
Estimated End: **3**



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Images



Iodine Satellite (iSAT).jpg

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(<https://techport.nasa.gov/image/102866>)

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

Earth, The Moon, Mars